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Original Research Article

Analysis of complete blood counts in rotaviral gastroenteritis with special emphasis on platelet indices

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ABSTRACT

Background: The objectives of this study was to analyze complete blood counts in rotaviral gastroenteritis with special emphasis on platelet indices.
Methods: Children diagnosed as rotavirus gastroenteritis and healthy controls were enrolled in this study. Severity of acute gastroenteritis was classified into mild, moderate and severe grades using Vesikari score. Rotavirus was determined in fresh stool samples using rapid diagnostic rotavirus antigen test. Hemoglobin, leukocyte, neutrophil to lymphocyte percentage ratio, platelet counts, mean platelet volume (MPV), platelet distribution width (PDW) and platelet crit (PCT) levels were assessed for all children. It's a case control study conducted at Pediatric Speciality Hospital.
Results: There were 30 cases with mean age 1.58 years. Healthy controls were 30 with mean age 2.10 years. Mean Hb was lower in cases. Mean of platelet counts was higher in cases. Mean MPV levels was lower in cases. Mean PCT value was higher in cases. Mean MPV to platelet ratio value was lower in cases. All parameters values showed no significant difference among mild, moderate and severe groups of rotaviral gastroenteritis cases. Platelet count was negatively correlated with Hb, MPVP and positively correlated with TLC and PCT. MPV was positively correlated with MPVP and PDW. PCT was negatively correlated with Hb, MPVP and positively correlated with TLC and platelet count.
Conclusions: MPV can be used as negative acute phase reactant in rotavirus gastroenteritis and so is the MPV to platelet ratio. Platelet count is acute phase reactant in rotavirus gastroenteritis and so is the platelet crit value.

Keywords: Complete blood count, Mean platelet volume, Platelet indices, Rotavirus gastroenteritis

INTRODUCTION

Under 5 mortality rates in India is 39 per 1000 live births (2016). In India the leading causes of death among children under 5 years in 2016 are preterm, birth complications, acute respiratory tract infections, intrapartum related complication, congenital anomalies and diarrheal diseases. Every year approximately 12 lakh children die in this age group. India accounts for 20% of under 5 deaths worldwide and contributes maximum to this burden. Diarrhea is one among top causes of under 5 mortality. Rotavius is commonest organism causing severe diarrhea in children worldwide. It is estimated to be responsible for 611,000 annual childhood deaths globally, and another 2 million hospitalizations every year.[1,2] More than 80% of these deaths occur in low-income countries.[1-3] It is estimated that India spends approximately Rs. 2.0-3.4 billion (US$ 41-72 million)

annually for the treatment of rotavirus diarrhea in children <5 years of age.[4]

Rotavirus is a double stranded RNA, belongs to Reoviridae family. There are seven rotavirus groups (A to G). Only groups A, B and C infect humans. Majority of severe infections are caused predominantly by group A rotaviruses. Although humans of all ages are susceptible to rotavirus infection, children 3 to 24 months of age account for most of severe infections. It transmits by faeco-oral route. Incubation period is 1-2 days. Infection starts with fever and vomiting followed by three to seven days of diarrhea. Abdominal pain is associated symptom in some cases. Complications include severe dehydration, electrolyte disturbances, metabolic acidosis, seizures and encephalopathy in few cases.

Considering the high burden of the disease, it's important to diagnose and treat the same to improve the outcome. Various laboratory procedures available for rotavirus diagnosis are electron microscopy, latex agglutination assays, electrophoresis, immunochromatography, enzyme linked immunosorbent assays (ELISA) and reverse transcription polymerase chain reaction(RT-PCR).

METHODS

This was a case control study. The study was conducted at Pediatric Speciality Hospital between January to June 2018, after obtaining institutional ethics committee approval. Cases and controls were included in the study after obtaining consent from them.

Thirty children diagnosed with rotaviral diarrhea, between the ages of 3 months to 5 years were included in the study as cases. This group consisted of 22 boys and 8 girls. Patients with multiple foci/concurrent infections, chronic diseases, protein energy malnutrition, immunodeficiencies, prior medications were excluded. There were 30 healthy controls with similar age group. This group included equal number of boys and girls. These controls were apparently healthy, visited outpatient department for medical control. Both cases and controls underwent detailed physical examination.

Rotavirus detection in stool samples was done using SD Bio line rotavirus rapid test, which is an immunoassay for the detection of group A rotavirus in fecal samples. This test utilizes two kinds of antibody in a solid phase sandwich immunochromatography to detect group specific proteins. Sensitivity and specificity of this test are 94% and 98.3%, when clinical samples were confirmed by RT-PCR. Stool cultures and antigen tests were done to rule out bacterial causes.

Complete blood counts were analysed using Mindray BC3600 auto hematology analyzer. It operates on the principles of electrical impedance method for cell counting and cyanide-free for hemoglobin.

All rotavirus cases were classified into Mild (score <7), moderate (score 7-10) and severe (score >=11) groups based on Vesikari scoring system. Hemoglobin (Hb), total leucocyte count (TLC), neutrophil to lymphocyte percentage ratio (NLR), platelet count, mean platelet volume (MPV), platelet distribution width (PDW), mean platelet volume to platelet ratio (MPVP) were assessed for both cases and controls and were compared.

Data was analysed using Statistical Package for social sciences trial version 21. Statistical tests used were unpaired T test to see the statistical difference between the means of cases and controls. ANOVA was used to see the mean difference between various categories of severity of rotaviral gastroenteritis cases. Then Pearson's coefficient of correlation was used to see the correlation between various quantitative parameters and p value <0.05 was taken as statistically significant.

RESULTS

There were 30 cases, comprising of 22 boys and 8 girls. Mean age of cases was 1.58 years with standard deviation of 1.329. Healthy controls were 30, with equal number of boys and girls. Mean age of controls was 2.10 years with standard deviation of 1.527.

Table 1: Comparison of laboratory parameters between cases and controls.

Parameters	Mean of Cases	Mean of Controls	P value
Hb	9.20	11.91	0.000
TLC	9430	7409	0.015
Platelet	3.68	2.52	0.000
MPV	7.96	8.12	0.407
PDW	14.94	15.25	0.109
PCT	0.30	0.20	0.000
MPVtoP	2.35	3.45	0.000
NLR	1.92	1.93	0.979

Table 1 shows the comparison of parameters between rotavirus gastroenteritis cases and healthy control groups. Mean Hb in cases was lower than control group which was statistically significant with p value <0.05. Mean of Total leucocytes counts in cases was higher than control group which was statistically not significant. Mean of platelet counts in cases was higher than control group which was statistically significant. Mean MPV levels in cases was lower than control group which was statistically not significant. Mean PDW in cases was lower than control group which was statistically not significant. Mean PCT value in cases was higher than control group which was statistically significant. Mean MPV to platelet ratio value was lower than control group which was statistically significant. Mean neutrophil to lymphocyte ratio value in cases was lower than control group which was statistically not significant.

Table 2: Comparison of parameters of gastroenteritis cases between and within mild, moderate and severe groups using ANOVA.

		Sum of squares	df	Mean square	F	Sig.
Hb	Between groups	2.366	2	1.183	0.250	0.781
	Within groups	127.793	27	4.733		
	Total	130.159	29			
TLC	Between groups	73500.000	2	36750.000	0.003	0.997
	Within groups	372749500.000	27	13805537.037		
	Total	372823000.000		29		
Platelet	Between groups	32.312	27	1.197		
	Within groups					
	Total	32.716	29			
MPV	Between groups	1.062	2	0.531	1.006	0.379
	Within groups	14.245	27	0.528		
	Total	15.307	29			
PDW	Between groups	3.038	2	1.519	1.594	0.222
	Within groups	25.735	27	0.953		
	Total	28.774	29			
PCT	Between groups	0.012	2	0.006	0.531	0.594
	Within groups	0.295	27	0.011		
	Total	0.306	29			
MPVP	Between groups	0.400	2	0.200	0.308	0.737
	Within groups	17.544	27	0.650		
	Total	17.945	29			
NLR	Between Groups	0.147	2	0.074	0.079	0.924
	Within groups	25.178	27	0.933		
	Total	25.325				

Table 2 shows comparison of values laboratory parameters between mild, moderate and severe groups of rotaviral gastroenteritis cases. All parameters values showed no significant difference among these groups.

Table 3: Correlation between laboratory parameters in gastroenteritis cases.

	Platelet	MPV	PDW	PCT	MPVP
Hb	-0.438		0.349	-0.404	0.463
TLC	0.535			0.559	-0.478
Platelet		-0.157 /p.231		0.952	-0.950
MPV			0.656		0.396
PDW		0.656			0.351
PCT	0.952				-0.851
MPVP	-0.950	0.396	0.351	-0.851	

Values read as correlation coefficient/sig. (2 tailed correlation. P value is<0.05. where not mentioned.

Table 3 shows correlation between laboratory parameters in gastroenteritis cases .Pearson's correlation analysis revealed following inter correlation between parameters of cases. Hb was negatively correlated with platelet count and positively correlated with MPVP. Platelet count was negatively correlated with Hb, MPVP and positively correlated with TLC and PCT. MPV was positively correlated with MPVP and PDW. PCT was negatively correlated with Hb, MPVP and positively correlated with TLC and Platelet count. There was no significant correlation between lab parameters and gastroenteritis score.

DISCUSSION

Platelets play crucial role in hemostasis. Over recent years platelet activation and their part in modulating innate and adaptive immune responses have been identified. Few studies have tried to establish correlation between platelet indices and inflammation. Mean platelet volume has been frequently used as an inflammatory marker associated with inflammation. MPV is a calculated measurement of average size of platelet in blood. Platelet crit is a measure of total platelet mass. PDW reflects uniformity of platelet size. Our study is the first of its kind in Indian published data, to the best of our knowledge. MPV can be a negative or positive acute phase reactant in various inflammatory conditions based on the severity of the systemic inflammation.[5] Karna M et al, found that MPV levels in patients infested with

Entamoeba histolytica were lower than in controls.[6] Similarly, Mete et al, recently showed that MPV levels were lower in children with rotavirus gastroenteritis than the in healthy peers. Moreover, they did not find any difference between two disease severity groups regarding MPV levels.[7] Tanju C et al, study demonstrated that MPV levels of children with rotavirus gastroenteritis were significantly lower than the those of healthy controls.[8] In this study mean MPV levels were lower in cases than control group but statistically not significant. This insignificance may be due to small number of cases in our study.

Tanju C et al, study showed MPV levels were negatively correlated with platelet count. But in this study this inverse correlation between platelet and MPV was noted but statistically not significant. Though both platelet and MPV are considered as acute phase reactants, this inverse correlation has been observed in some conditions and it does reflect an effort to maintain homeostasis by preserving a constant platelet mass.[9-11] MPV and MPV to Platelet ratio were positively correlated in our study. Platelet count and MPV to Platelet ratio are inversely related to each other. More studies are required to define the roles of these ratios in rotavirus gastroenteritis cases. Limitations of this study are small sample size, lack of other microbial gastroenteritis group.

"What is already known?"

Mean platelet volume role as an inflammatory mediator is being explored in various diseases. Very few studies have documented role of MPV in rotaviral gastroenteritis.

"What this study adds"

Mean platelet volume can be used as negative acute phase reactant in rotavirus gastroenteritis and so is the MPV to platelet ratio. Platelet count is an acute phase reactant in rotavirus gastroenteritis and so is the platelet crit value.

CONCLUSION

Rotaviral gasrtroenteritis is common in children with anemia. Platelet indices are easily available, cheap useful laboratory parameters as markers of inflammation in rotavirus gastroenteritis cases.

Mean platelet volume can be used as negative acute phase reactant in rotavirus gastroenteritis and so is the MPV to platelet ratio.

Platelet count is acute phase reactant in rotavirus gastroenteritis and so is the Platelet crit value.

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